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Contributions to the Knowledge of Mammals in Çorum Province, Turkey

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ABSTRACT

A total of 42 mammal species were determined and new records reported for the first time in Çorum Province, Turkey. Field studies were carried between 2009-2010 and 2015-2016. One species of hedgehog and shrew, four bat species, six rodent species, roe deer and three carnivore species were recorded for the first time. We also expanded the known distribution and confirmed the presence of four rodent species (Spermophilus xanthophyrmnus, Microtus dogramaci, Mesocricetus brandti and Meriones tristrami) in the province. In addition, some information related to the distribution and the habitat associated to some taxon were provided in the study.

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INTRODUCTION

Turkey is the only country which was covered almost entirely by three of the world's 34 biodiversity hotspots: The Caucasus, Irano-Anatolian, and Mediterranean [1]. In Palaearctic Region, mammals are represented by 13 orders, 42 families and 843 species [2]. Turkey is located among Asian, European, and African continents, resulting in the diversification in ecological conditions, the geological structure, climatic conditions. This leads to a rich biodiversity. It is known that Turkey has more species in terms of the number of mammals than that of any other region in the world (North Africa: 84; Iberia: 77; Italy; 72, Balkans: 80, Near East: 62 [3], 1999, Turkey: 132 [4-6]).

Corum located in two different geographical regions is located in between Central Anatolian and Black Sea Regions. Kızılırmak River which divides the city into two parts has an important role in the formation of Anatolias biodiversity. Depending on these geographic features, the diversity of mammals also varies. To date, few studies on the determination of the mammal fauna have been carried out to shed light on the biodiversity in Corum. In addition, those were local studies including small number of species. So far, a total of 26 mammal species were reported in Çorum (Table 1).

When the studies reported in the literature on mammalian species present in Çorum is taken into account, it is seen that these works only includes small mammalian species and the data were obtained from systematic studies.

In this work, it was aimed to determine mammal fauna and important areas for mammals in Corum. A total of 42 mammal species was identified in the field studies. Of these species, 26 had been already reported in the literature and 16 of them were observed for the first time in Çorum. In addition, new locality reports of some species were provided.

MATERIALS AND METHODS

Systematical field studies were carried out between 2009-2010 and 2015-2016 at all areas located in Corum province, in order to determine the mammals spreading within the borders. The GPS points of all stations were recorded in UTM format and the records were taken at this coordinates and its immediate vicinity. Passive infrared camera traps

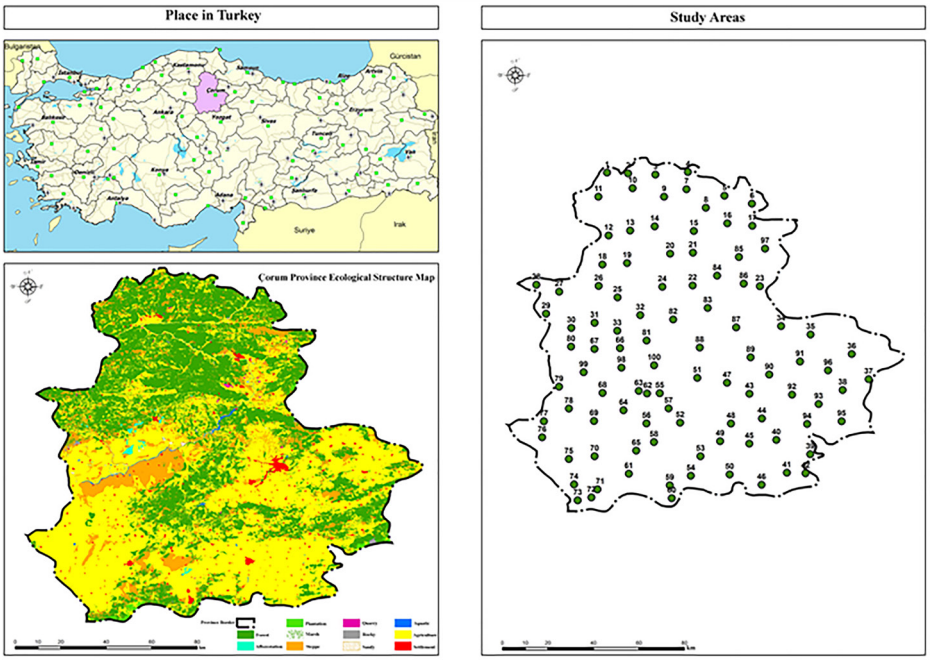

Figure 1. Map of localities listed in the text. Numbers correspond to those are given in Appendix

(Scoutguard SG570V and Bushnell Trophy Cam) were employed to determine large mammals. In addition to camera traps, large mammal fauna was also recorded using noninvasive methods such as counting scats, footprints, and other remaining.

In the detection of small mammals, Sherman live capture traps were used. The small mammalian individuals caught in the trap were released after identification of the species. Individuals who cannot be morphologically diagnosed were identified by karyotype and skull characteristics examined in laboratory conditions.

Studies to identify bat species were conducted at three different localities and ultrasonic device (Pettersson D 500X) was implemented to record the sounds. BatSound and BatExplorer computer software were used for further analysis. Species conservation status were organized according to the IUCN, BERN and CITES criteria's. The localities where the studies were conducted is shown in Figure 1.

RESULTS AND DISCUSSION

Within the scope of this study, a total number of 42 mammal species belonging to Erinaceomorpha, Soricomorpha, Chiroptera, Lagomorpha, Rodentia, Carnivora and Artiodactyla were detected. 16 of these species were recorded in Corum for the first time. The results obtained from our study along with those reported previously for Corum province is summarized in Table 1. The taxonomy of the new records present in Çorum province is provided using Wilson and Reeder [7]. Additional records are also provided for some species.

Comparison with the previously reported studies

Orhan and Beaucournu [8] recorded Crocidura suaveolens in Abdullah Plateau located in Kos Mountain at northern part of Corum. In addition to being present in Kos Mountain, we also found this species in floodplain forestland areas of Kos Mountain. We also observed the presence of this species in Kırkdilim, Gölünyazı Lake, Osmancık, and Kargı districts. In the same study, the authors also recorded Apodemus sylvaticus in the same region. On the other hand, in our study we indicated that this record was not valid. It may be suggested that this species might be A. witherbyi instead of A. sylvaticus. Orhan and Beaucournu [8] also recorded Microtus levis in the same area, which was confirmed by our study. Kefelioglu et al. [18] and Kyrstufek et al. [19] recorded Microtus socialis in Çayköy village of Mecitözü, a district of Çorum province. On the other hand, in our field study, this species was not observed in this area. Our results showed that cytotypes of Nannospalax xanthodon species was present in Corum regardless of the region but densely forested and rocky mountainous regions, which in an excellent agreement with the reports previously published [21,22].

Forest dormouse samples were collected from Çorum province in the studies on allozyme variations and biometrics of Dryomys nitedula [15,25]. On the other hand, our results did not indicate the presence of this species. In some studies conducted to the identify of age group of Martes foina (Beech Marten) in Turkey, the authors collected some samples in Çorum province [31,32]. We showed that this species is present in entire Çorum province.

In another study, Albayrak [33] stated that factory wastes

Table 1. Mammal species of Çorum Province (including comparisons with our study)

Family Name	Species	English Name	BERN	CITES	IUCN	Former Studies	This Study with the location numbers
ERINACEIDAE	Erinaceus concolor	Southern White-breasted Hedgehog	-	-	LC	-	This species is spreading throughout Turkey except Thrace. Up to date, no records were given for Çorum, but we have determined that this species spreads throughout the Çorum.
SORICIDAE	Crocidura suaveolens	Lesser White-toothed Shrew	Ek II	-	LC	[8]	X
SORICIDAE	Crocidura leucodon	Bicolored Shrew	Ek III	-	LC	-	Dead individuals were encountered at each stations of 13 and 74. Work station number 13 is an old-coniferous forest.
LEPORIDAE	Lepus europaeus	European Hare	-	-	LC	[9]	X
SCIURIDAE	Sciurus anomalus	Caucasian Squirrel	Ek II	-	LC	[10, 11]	X
SCIURIDAE	Spermophilus xanthophyrmnus	Asia Minor Ground Squirrel	-	-	NT	[12-16]	X
CRICETIDAE	Mesocricetus brandti	Turkish Hamster	-	-	NT	[12]	X
CRICETIDAE	Arvicola amphibius	Water Vole	-	-	LC	-	52 (Küçük Keşlik Village, water canal)
CRICETIDAE	Microtus subterraneus	European Pine Vole	-	-	LC	-	13 (Kös Mountain), 63 (Uğurludağ), 87 (Çatak Nature Park)
CRICETIDAE	Microtus levis	Sibling Vole	-	-	LC	[8]	X
CRICETIDAE	Microtus guentheri	Guenther's Vole	-	-	LC	-	All agriculture areas south part of Province
CRICETIDAE	Microtus dogramacii	Doğramaci's Vole	-	-	LC	[17]	X
CRICETIDAE	Microtus socialis	Social Vole	-	-	LC	[18, 19]	-
CRICETIDAE	Meriones tristrami	Tristram's Jird	-	-	LC	[20]	X
SPALACIDAE	Nannospalax xanthodon	Lesser Mole Rat	-	-	DD	[21, 22]	X
MURIDAE	Apodemus witherbyi	Steppe Field Mouse	-	-	LC	[8]	X
MURIDAE	Apodemus mystacinus	Broad-toothed Field Mouse	-	-	LC	-	1
MURIDAE	Apodemus flavicollis	Yellow-necked Mouse	-	-	LC	-	3, 10
MURIDAE	Rattus rattus	Brown Rat	-	-	LC	-	25, 82
MURIDAE	Rattus norvegicus	Black Rat	-	-	LC	[23]	X
MURIDAE	Mus macedonicus	Macedonian Mouse	-	-	LC	[24]	X
MURIDAE	Mus domesticus	House Mouse	-	-	LC	[24]	X
GLIRIDAE	Dryomys nitedula	Forest Dormouse	Ek III	-	LC	[15, 25]	-
RHINOLOPHIDAE	Rhinolophus ferrumequinum	Greater Horseshoe Bat	Ek II	-	LC	-	59 (Boğazkale, rocky place). Maximum frequency 67,1 kHz, Minimum frequency 60,6 kHz, Peak frequency 106,0 kHz, call length 9,2 ms, call distance 30 ms.
RHINOLOPHIDAE	Rhinolophus hipposideros	Lesser Horseshoe Bat	Ek II	-	LC	-	84
VESPERTILIONIDAE	Myotis blythii	Lesser Mouse-Eared Bat	Ek II	-	LC	[26]	-
VESPERTILIONIDAE	Myotis myotis	Greater Mouse-eared Bat	Ek II	-	LC	-	59 (Boğazkale)
VESPERTILIONIDAE	Pipistrellus pipistrellus	Common Pipistrelle	Ek III	-	LC	-	29 (Bayat)
VESPERTILIONIDAE	Eptesicus serotinus	Serotine Bat	Ek II	-	LC	[27]	-
CANIDAE	Canis lupus	Grey Wolf	Ek II	Ek II	LC	[28]	X
CANIDAE	Canis aureus	Golden Jackal	-	Ek III	LC	-	13
CANIDAE	Vulpes vulpes	Red Fox	-	Ek III	LC	[29]	X
URSIDAE	Ursus arctos	Brown Bear	Ek II	Ek II	LC	[28]	X
MUSTELIDAE	Mustela nivalis	Least Weasel	Ek III	-	LC	[30]	X
MUSTELIDAE	Martes foina	Beech Marte	Ek III	Ek III	LC	[31, 32]	X
MUSTELIDAE	Meles meles	Badger	Ek III	-	LC	-	12, 13, 14, 63, 38 (dead sample)
MUSTELIDAE	Lutra lutra	Otter	Ek II	Ek I	NT	[33]	X
FELIDAE	Felis slivestris	Wild Cat	Ek II	Ek II	LC	[31]	-
FELIDAE	Lynx lynx	Lynx	Ek III	Ek II	LC	-	12, 13, 14, 62, 63
SUIDAE	Sus scrofa	Wild Boar	Ek III	-	LC	[34]	X
CERVIDAE	Cervus elaphus	Red Deer	Ek II	Ek III	LC	[31]	X
CERVIDAE	Capreolus capreolus	Roe Deer,	Ek III	-	LC	-	12, 13, 14, 63

and uncontrolled hunting resulted in the extinction of Lutra lutra in Kuruçay in Cemilbey district. Our study supported the author statement and the population of this species was not detected in the same area. Another study conducted by our group (data not shown here) indicated the presence of this species in Kargi and Kızılırmak.

Unlike Kumerloeve [31] who reported the presence of Felis Silvestris in Osmancık Province, this species was not detected in our study. The records of Cevus elaphus, also presented in the same study, have been verified in our study. This species has not been found elsewhere in Corum. Kefelioğlu [20] recorded Meriones tristrami around the district of Dodurga. In this study, the presence of this species was validated in Kirkdilim, Central District and its distribution in Corum was expanded. While Tuncdemir [12] reported the presence of Mesocricetus brandti in the vicinity of center of Corum, our results revealed that this species is exist in the steppe areas around agricultural areas in the south and southeastern parts of Corum. As a result, the distribution of Mesocricetus brandti was expanded.

Albayrak et al. [10] and Aslan et al [11] used 9 individuals belong to Sciurus anamolus collected in Çorum in their studies. In our study, this species was observed frequently at the forested areas in the northern part of the province.

Although Beron [26] reported that Myotis blythii species dwell around Bogazkale and Benda et al. [27] observed bone residues of Eptesicus serotinus in their study on Strix aluca pellets around Bogazkale, any individual or voice record belong to these species were observed. According to the report on population and protection status of the large mammals in Turkey, Canis lupus and Ursus arctos exist in Corum province [28]. During camera trap study, brown bear was captured in Kargı District and wolf was recorded in almost all habitats outside the agricultural areas in Corum.

Krystufek and Vohralik [15] stated that Spermophilus xanthoprymnus had a wide spread in Anatolia, including Denizli, Afyonkarahisar, Eskişehir, Ankara, Kastamonu, Çorum, Sivas, Trabzon, Bayburt, Kars, Iğdır, Ağrı, Erzurum, Malatya, Mersin, Konya, Antalya, and Van. They used samples of this species which were collected from the district of Dodurga in Corum. In addition, the authors recorded the same species in Amasya, Hamamonu, Dedekoy. As a result of this finding the authors suggested that samples were actually collected from Amasya instead of Corum. In the study on the phylogenetic relations of European and Asia minor ground squirrel, Çorum province Sungurlu district samples collected from Kavşut and Büyük İncesu villages and Alaca district have been used [16]. In our study we sampled the species from a new point in Central District additional to previous locations and expanded the distribution area of this species.

Mus macedonicus and M. domesticus samples for morphological studies have been collected from different parts of Turkey including Çorum by Çolak et al. [24]. In our study, these two species are frequently observed in Çorum.

In a karyological study on the taping of Lepus europaeus from Turkey, researchers have studied 2 male individuals collected from Çorum province borders (Demirtas et al., 2010). In almost all of Çorum, it is possible to observe the species outside settlements.

Mustela nivalis were recorded in Kırıkkale and Çorum in biological studies [30]. In the whole of Çorum province, the species were recorded by camera traps, direct observations and questionnaire surveys.

In the study that aimed to investigate allozyme variations of *Rattus norvegicus*, researchers collected samples from Çorum province have also been used [23]. In our study, the species was sampled especially in settlements.

İbis et al. [29] also used a sample of *Vulpes vulpes* collected from the Boğazkale district of Çorum province in the study on red fox populations in Turkey. They used examples from Çorum province in his study on the phylogeny of *Sus sucrofa* (Wild boar). The individuals belonging to these two species were observed in all of the areas where we conducted the field study and they were thought to be spread all around Çorum.

CONCLUSION

This was the first long term study on mammals covers whole of Çorum province. A total of 42 mammal species were detected and 16 of these species were recorded from the village for the first time. On the other hand, it was determined that presence of some species referenced by previous literature in the village were doubtful and some species have been found to distribute widespread areas than previously mentioned. Only when these outputs are taken into consideration, it is obvious that our work is an important inventory for Çorum province and will be an important baseline source for future biological studies. .

In our study, we captured lynxusing camera traps for the first time in Çorum province, in black pine forests of Uğurludağ and Kös Mountain Wildlife Development Area. Although it was not recorded in the Çatak Nature Park, it is thought to be using Nature Park due to the similarity of vegetation. Another large mammal species, golden jackal was also captured for the first time in province, also in Kös Mountain Wildlife Development Area.

Kızılırmak, one of the larger rivers of Turkey forms

a barrier between Kös Mountain Wildlife Development Area and Ilgaz Mountains and also rest of Blacksea Region. Therefore, for large mammal species, this area, which has very narrow transition corridors, has been identified as a highly important ecosystem area in Çorum. This region has a great ecological importance and it is highly sensitive. For this reason, we defined this area as a "protection priority area".

For small mammal species (shrew, hedgehog and rodents), different parts of the province have important ecological characteristics in terms of habitats and vegetation types. As a result of our study, fauna of small mammal in Çorum was detailed but further species-specific studies should be done to distinguish hot spots for small mammals in Çorum.

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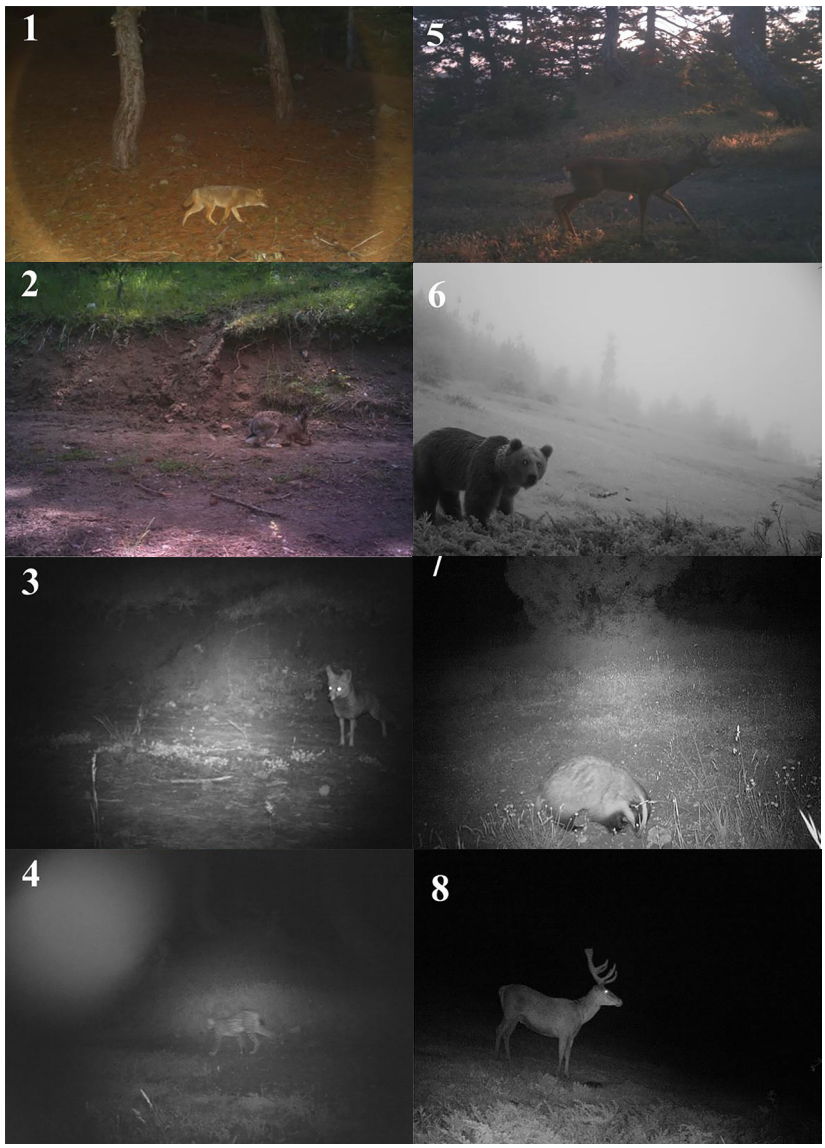

Figure 2. Some mammals records from Çorum Province. 1. Grey Wolf; 2. European Hare; 3. Red Fox; 4. Eurasian Lynx; 5. Roe Deer; 6. Brown Bear; 7. Badger; 8. Red Deer

Table 2. Station numbers and coordinates

Station Numbers	UTM Zone	N	E
1	36T	613482	4569441
2	36T	620494	4569220
3	36T	629559	4568849
4	36T	640265	4570189
5	36T	652612	4560030
6	36T	661772	4556763
7	36T	639923	4562625
8	36T	646537	4554631
9	36T	632566	4559226
10	36T	622089	4562787
11	36T	610806	4558817
12	36T	614457	4541877
13	36T	621568	4544187
14	36T	629678	4546168
15	36T	642754	4544387
16	36T	653832	4547959
17	36T	662159	4547043
18	36T	612572	4529093
19	36T	620787	4529890
20	36T	635063	4534270
21	36T	642626	4534833
22	36T	642803	4520430
23	36T	665212	4520608
24	36T	632701	4519682
25	36T	617866	4514788
26	36T	611468	4519691
27	36T	598344	4516979
28	36T	590694	4519918
29	36T	594090	4507298
30	36T	602645	4501231
31	36T	610361	4503540
32	36T	625544	4507149
33	36T	617988	4500165
34	36T	672716	4503268
35	36T	682655	4499807
36	36T	696627	4491583
37	36T	702582	4480738
38	36T	693991	4475720
39	36T	683864	4447341
40	36T	672260	4453349
41	36T	676156	4438997
42	36T	682420	4438903
43	36T	662786	4473381
44	36T	667177	4462631
45	36T	663189	4451463
46	36T	667736	4433589
47	36T	655187	4478017
48	36T	656854	4460191
49	36T	653353	4452376
50	36T	656867	4437840
51	36T	645157	4479962
52	36T	639749	4460229
53	36T	646896	4445641
54	36T	643801	4437012
55	36T	632693	4473042
56	36T	628458	4459705
57	36T	635749	4466416
58	36T	631099	4451545
59	36T	636733	4432704
60	36S	637522	4427093
61	36T	622905	4437558
62	36T	628429	4472806
63	36T	625646	4473880
64	36T	620613	4465359
65	36T	625199	4447686
66	36T	619043	4492597
67	36T	610497	4492048
68	36T	613491	4472835
69	36T	610826	4460461
70	36T	611209	4445008
71	36T	612396	4430509
72	36S	610402	4426921
73	36S	605815	4425632
74	36T	604504	4432547
75	36T	602569	4443680
76	36T	593464	4453099
77	36T	593944	4460147
78	36T	602291	4465819
79	36T	598848	4475368
80	36T	602656	4492966
81	36T	629657	4498965
82	36T	641260	4504988
83	36T	649308	4511242
84	36T	651892	4525767
85	36T	660055	4535449
86	36T	660593	4524855
87	36T	657594	4503438
88	36T	652167	4499524
89	36T	665179	4495095
90	36T	671181	4486018
91	36T	683178	4489223
92	36T	676121	4476921
93	36T	685408	4472838
94	36T	678687	4461595
95	36T	692472	4464297
96	36T	690315	4486519
97	36T	666875	4540934
98	36T	623221	4491262
99	36T	617430	4487100
100	36T	634545	4493222

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